AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A motor position controller comprising:

a position detection unit for detecting a position of a motor to be controlled;

a speed calculation unit for calculating a speed of the motor;

a position control unit for performing a position control by outputting a speed command so that the motor position fed back from the position detection unit is consistent with a position indicated by a position command;

a speed control unit for performing a speed control based on a proportional-integral control by outputting a torque command so that the speed fed back from the speed calculation unit is consistent with the speed indicated by the speed command; and

a torque control unit for performing a torque control based on the torque command;

wherein the speed control unit comprises:

a delay compensation low-pass filter in the speed control unit having a transfer function corresponding to a delay of a speed control system;

an integral control system including a speed integrator, the speed integrator being adapted to integrate a speed difference between a speed

indicated by a delay speed command and the speed of the motor, the delay speed command being obtained by inputting the speed command into the delay compensation low-pass filter in the speed control unit;

a proportional control system for outputting a command proportional to a difference between the speed indicated by the speed command and the speed of the motor;

an addition means for adding an output of the integral control system and an output of the proportional control system; and

a multiplication means for multiplying an output of the addition means by a speed proportional gain to produce the torque command.

2. (Original) The motor position controller according to claim 1, further including:

a speed feedback low-pass filter having a transfer function that prevents ripples caused by quantization errors and/or position errors detected by the position detection unit, from appearing in the torque command;

wherein the proportional control system includes a subtraction means for calculating a difference between a filtered speed and the speed indicated by the speed command, the filtered speed being obtained by inputting the speed into the speed feedback low-pass filter.

3. (Original) The motor position controller according to claim 1, wherein the position control unit comprises:

a subtraction means for calculating a position difference between the position

indicated by the position command and the position detected by the position detection unit; and

a position loop multiplication means for multiplying the position difference by a position proportional gain.

4. (Original) The motor position controller according to claim 3, wherein the position control unit further includes:

a differentiator for differentiating the position command;

a multiplication means for multiplying an output of the differentiator by a feed forward gain; and

a feed forward low-pass filter having a transfer function for removing ripples caused by quantization errors of the position command;

wherein the position control unit outputs as the speed command a sum of a command output from the position loop multiplication means and a speed feed forward command output from the feed forward low-pass filter.

5. (Original) The motor position controller according to claim 3, wherein the position control unit further includes:

a differentiator for differentiating the position command;

a multiplication means for multiplying an output of the differentiator by a feed forward gain;

a feed forward low-pass filter having a transfer function for removing ripples caused by quantization errors of the position command; and

an integrator for integrating a difference between an output of the

differentiator and a differential value of the position detected by the position detection unit and to output the position difference to the position loop multiplication means;

wherein the position control unit outputs as the speed command a sum of a command output from the position loop multiplication means and a speed feed forward command output from the feed forward low-pass filter.

6. (Previously Presented) The motor position controller according to claim 4, wherein the feed forward gain is set in a range of 0.4 to 0.6.

7. (Original) The motor position controller according to claim 4, further including a delay compensation low-pass filter in the position control unit having a transfer function corresponding to a delay of the speed control system;

wherein the position difference between the position indicated by the position command that has passed through the delay compensation low-pass filter in the position control unit and the position is input into the position loop multiplication means.

8. (Original) The motor position controller according to claim 4, wherein the delay compensation low-pass filter in the position control unit having a transfer function corresponding to a delay of the speed control system is arranged between the differentiator and the integrator;

wherein a difference between an output of the differentiator that has passed through the delay compensation low-pass filter in the position control unit and the

differential value of the position is input into the integrator.

9. (Previously Presented) The motor position controller according to claim 7, wherein the feed forward gain is 1 or a value close to 1.

10. (Original) A motor position controller comprising:

a position detection unit for detecting a position of a motor to be controlled;

a speed calculation unit for calculating a speed of the motor;

a position control unit for performing a position control by outputting a speed command so that the motor position fed back from the position detection unit is consistent with a position indicated by a position command;

a speed control unit for performing a speed control based on a proportional-integral control by outputting a torque command so that the speed fed back from the speed calculation unit is consistent with the speed indicated by the speed command; and

a torque control unit for performing a torque control based on the torque command;

wherein the speed control unit comprises:

a delay compensation low-pass filter in the speed control unit having a transfer function corresponding to a delay of a speed control system;

an integral control system including a speed integrator, the speed integrator being adapted to integrate a speed difference between a speed indicated by a delay speed command and the speed of the motor, the delay speed command being obtained by inputting the speed command into the

delay compensation low-pass filter in the speed control unit, the integral control system multiplying an operand in the control system by a speed proportional gain to produce an output;

a proportional control system for producing a command by multiplying a difference, between the speed indicated by the speed command and the speed of the motor, by the speed proportional gain; and

an addition means for adding an output of the integral control system and an output of the proportional control system.

11. (Original) The motor position controller according to claim 10, further including:

a speed feedback low-pass filter having a transfer function that prevents ripples caused by quantization errors and/or position errors detected by the position detection unit from appearing in the torque command;

wherein the proportional control system includes a subtraction means for calculating a difference between a filtered speed and the speed indicated by the speed command, the filtered speed being obtained by inputting the speed of the motor into the speed feedback low-pass filter.

12. (Original) The motor position controller according to claim 10, wherein the position control unit comprises:

a subtraction means for calculating a position difference between the position indicated by the position command and the position detected by the position detection unit; and

a position loop multiplication means for multiplying the position difference by a position proportional gain.

13. (Original) The motor position controller according to claim 12, wherein the position control unit further includes:

a differentiator for differentiating the position command;

a multiplication means for multiplying an output of the differentiator by a feed forward gain; and

a feed forward low-pass filter having a transfer function to remove ripples caused by quantization errors of the position command;

wherein the position control unit outputs as the speed command a sum of a command output from the position loop multiplication means and a speed feed forward command output from the feed forward low-pass filter.

14. (Original) The motor position controller according to claim 12, wherein the position control unit further includes:

a differentiator for differentiating the position command;

a multiplication means for multiplying an output of the differentiator by a feed forward gain;

a feed forward low-pass filter having a transfer function to remove ripples caused by quantization errors of the position command; and

an integrator for integrating a difference between an output of the differentiator and a differential value of the position detected by the position detection unit and output the position difference to the position loop multiplication

means;

wherein the position control unit outputs as the speed command a sum of a command output from the position loop multiplication means and a speed feed forward command output from the feed forward low-pass filter.

15. (Previously Presented) The motor position controller according to claim 13, wherein the feed forward gain is set in a range of 0.4 to 0.6.

16. (Original) The motor position controller according to claim 13, further including a delay compensation low-pass filter in the position control unit having a transfer function corresponding to a delay of the speed control system;

wherein the position difference between the position indicated by the position command that has passed through the delay compensation low-pass filter in the position control unit and the position of the motor is input into the position loop multiplication means.

17. (Original) The motor position controller according to claim 14, wherein the delay compensation low-pass filter in the position control unit having a transfer function corresponding to a delay of the speed control system is arranged between the differentiator and the integrator;

wherein a difference between an output of the differentiator that has passed through the delay compensation low-pass filter in the position control unit and the differential value of the position of the motor is input into the integrator.

18. (Previously Presented) The motor position controller according to claim 16, wherein the feed forward gain is 1 or a value close to 1.

19. (Previously Presented) The motor position controller according to claim 5, wherein the feed forward gain is set in a range of 0.4 to 0.6.

20. (Previously Presented) The motor position controller according to claim 14, wherein the feed forward gain is set in a range of 0.4 to 0.6.

21. (New) The motor position controller according to claim 1, wherein, through the use of the delay compensation low-pass filter in the speed control, the difference between a speed indicated by the speed command with the delay corresponding to the delay of the speed control system and the actually delayed feedback speed can be rendered nearly zero, and causing a residual quantity in the speed integrator to approach zero, and thereby reducing a motor positioning time.

22. (New) The motor position controller according to claim 10, wherein, through the use of the delay compensation low-pass filter in the speed control, the difference between a speed indicated by the speed command with a delay corresponding to the delay of the speed control system and the actually delayed feedback speed can be rendered nearly zero, and causing a residual quantity in the speed integrator to approach zero, and thereby reducing a motor positioning time.